Summary of the Research Project: Assessing Groundwater Quality in Kewaunee County

This is an independent two-year study funded by DNR and led by the following scientists -

- Dr. Maureen Muldoon, UW Oshkosh Department of Geology
- Dr. Mark Borchardt, USDA Agricultural Research Service

The objectives of the study are:

1) Design a randomized, synoptic sampling plan that evaluates groundwater quality throughout Kewaunee County. The randomized sample will be stratified by depth to bedrock. Collect and analyze samples from the randomized sampling frame for nitrate and indicator bacteria.
2) Sample a subset of wells from the randomized and stratified sampling frame on a bi-weekly basis (i.e., once every two weeks) to assess seasonal variation in groundwater quality.
3) Sample a subset of wells once per season (four times per year) for viruses and fecal markers capable of distinguishing septic versus bovine sources of contamination.
4) Install an automated sampling system on one or more wells in order to determine the timing of peak transport for viruses and indicator bacteria.
5) Perform statistical analysis of samples collected from this study and of existing water-quality data from Kewaunee County to assess whether these data can shed light on spatial and temporal patterns of contamination.

The initial sampling event was conducted in November 2015. A total of 800 Kewaunee County well owners were contacted and 323 participated. The findings of this initial round of sampling were:

- E-Coli positive: 5 wells representing 1.5% of the sample
- Total Coliform positive: 86 wells representing 26.6% of the sample
- Nitrates > 10 ppm: 36 wells representing 11.1% of the sample
- These results are similar to sampling results from agricultural areas in other states
- Notes on initial sampling
    - The presence of total coliform does not necessarily indicate an unsafe well
    - All e-coli positive wells were in areas with depth to bedrock of less than 20 feet
    - The percentage of contaminated wells decreases as depth to bedrock increases
    - Total coliform does not equate to livestock contamination – other common causes are soil bacteria, poorly fitting well caps, insect infestation, and sampling error
    - Initial samples were taken during a time when manure is being actively land spread and

groundwater is moving – a subsequent large sample will be conducted in July 2016.

- Funding is being reallocated to provide a more robust study regarding virus and fecal marker occurrence and transport

Costs:

- $80,000 funded by the Wisconsin Department of Natural Resources over two years
- Additional funding from USGS for auto sampler construction for objectives 3 and 4